

# *Tagnite PEO Process for Gearbox Overhaul*



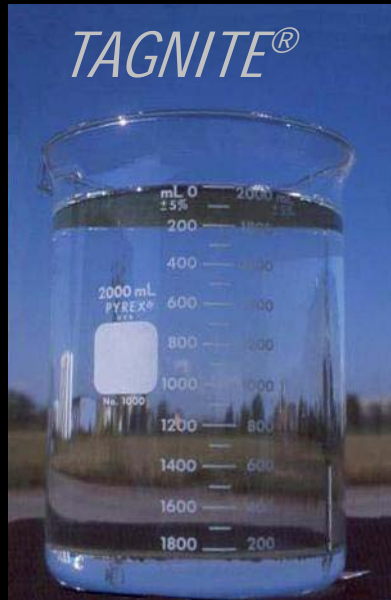
**TECHNOLOGY APPLICATIONS GROUP**  
*EXCELLENCE IN MAGNESIUM SURFACE PROTECTION*

ASETSDefense 2012  
San Diego, CA August 27 – 30, 2012

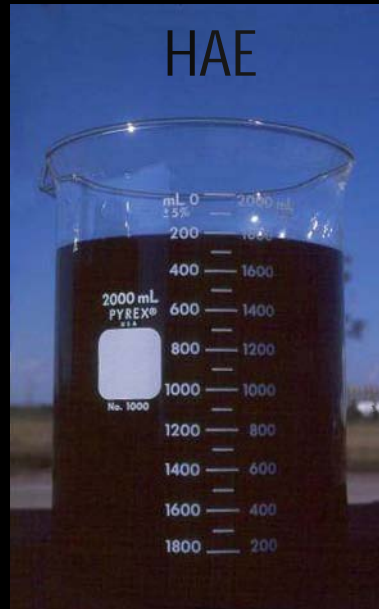
Bill Elmquist – President

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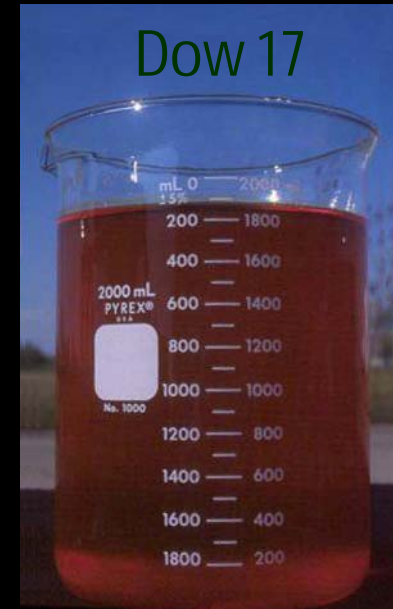
# Environmentally Clean Magnesium Finishing



5% \* chemical concentration



25%\* chemical concentration

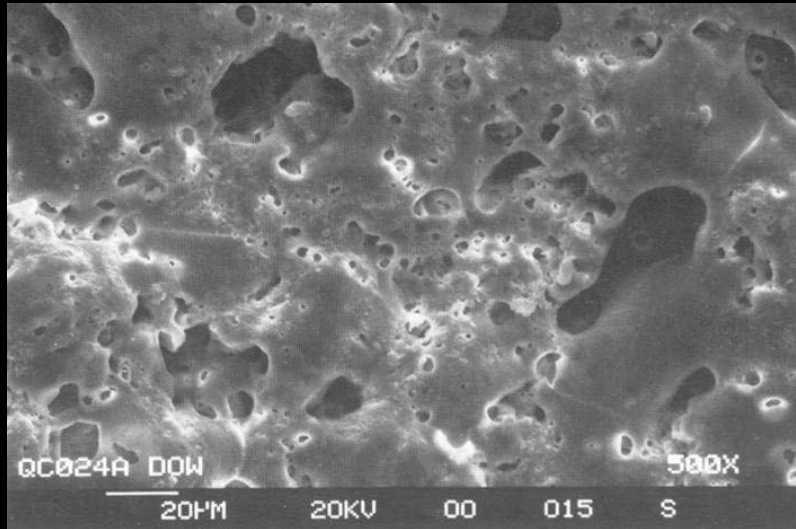


56% \* chemical concentration

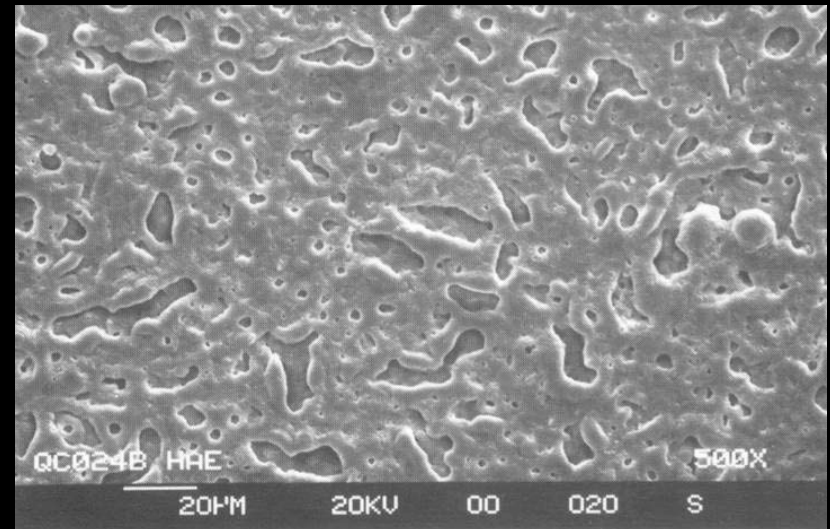
HAE contains heavy metals; Dow 17 contains heavy metals and chromium

\*Approximations

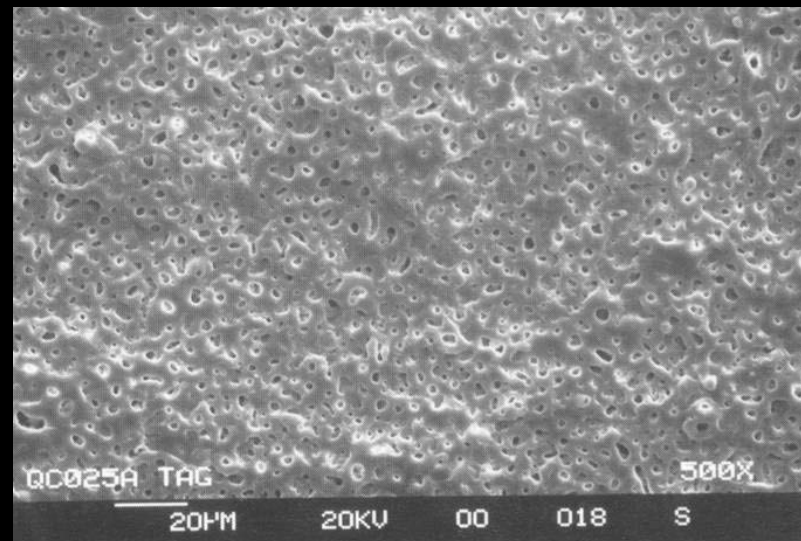
# Coating Morphology



Dow 17



HAE

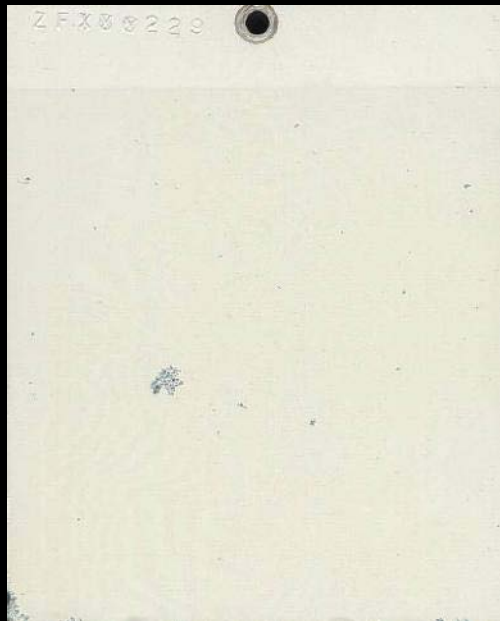


All photos shown at  
500x magnification.

TAGNITE®



# Superior Corrosion Resistance



**TAGNITE®**



**HAE**



**DOW 17**

**TAGNITE®, HAE & Dow 17 (Type I) on magnesium alloy  
ZE41 after 168 hours in salt spray**

*Only Tagnite Provides Inherent Corrosion Resistance*



CH-53



AH-6



F-35 Fighter



F-22 Fighter



MD 500/600



USMC EFV



AH-64 Apache



Pratt & Whitney PT-6 Engine



KC-135 Tanker

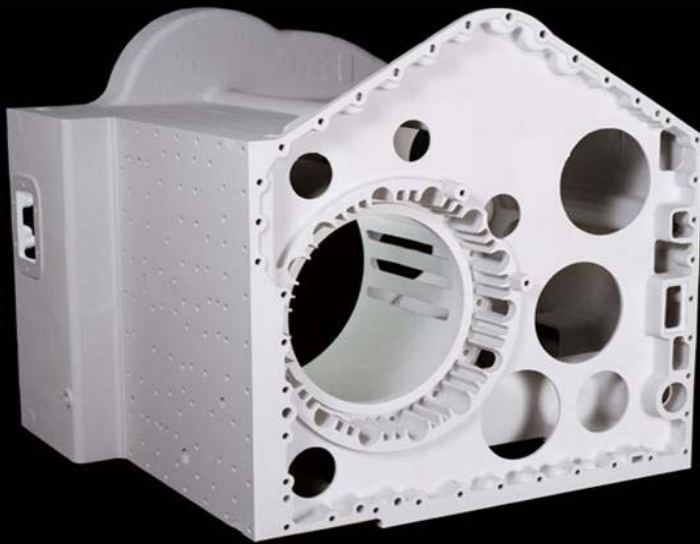


B-52 Bomber



Pratt & Whitney 308 Engine

Widely Specified



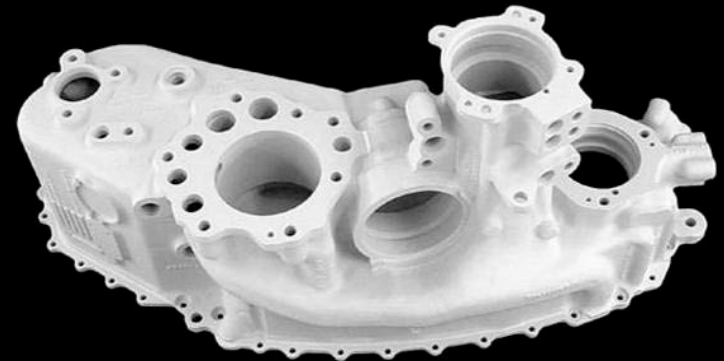
Magnesium Transmission Housing



Magnesium Oil Pan



Magnesium Gearbox



Magnesium Jet Engine Gearbox

Environmentally Clean Magnesium Finishing Since 1994

# Why Anodize a Magnesium Component During Overhaul

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- Magnesium Corrosion is a Costly Issue Affecting Most All DoD Platforms
- Current Overhaul Coatings are Mostly Chromate Conversion Based Processes That Provide Little Corrosion Protection
- These Poor Performing Conversion Coatings Have Resulted in High Life Cycle Costs for Most Magnesium Components



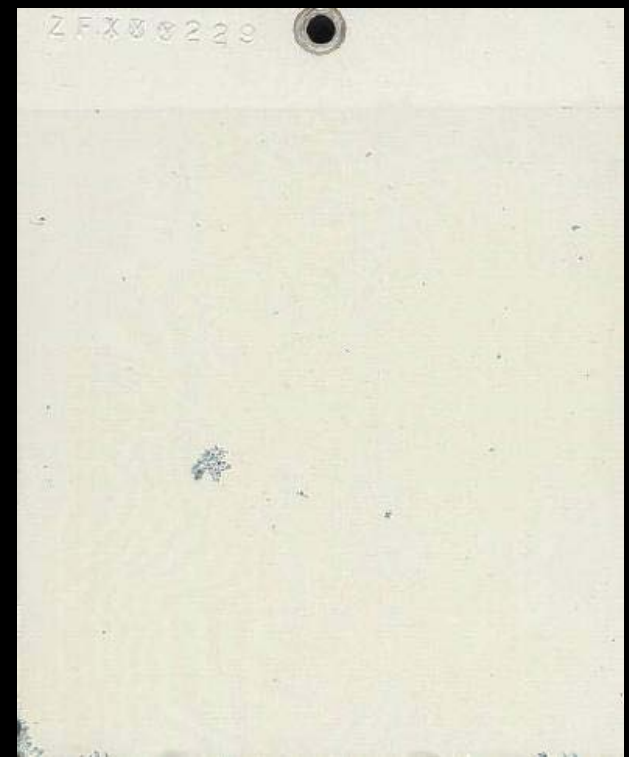
# ***Superior Corrosion Resistance Without the Environmental Headaches of Hexavalent Chromium***



Dow 19 Chromate  
Conversion 9 Hours  
Salt Fog Exposure

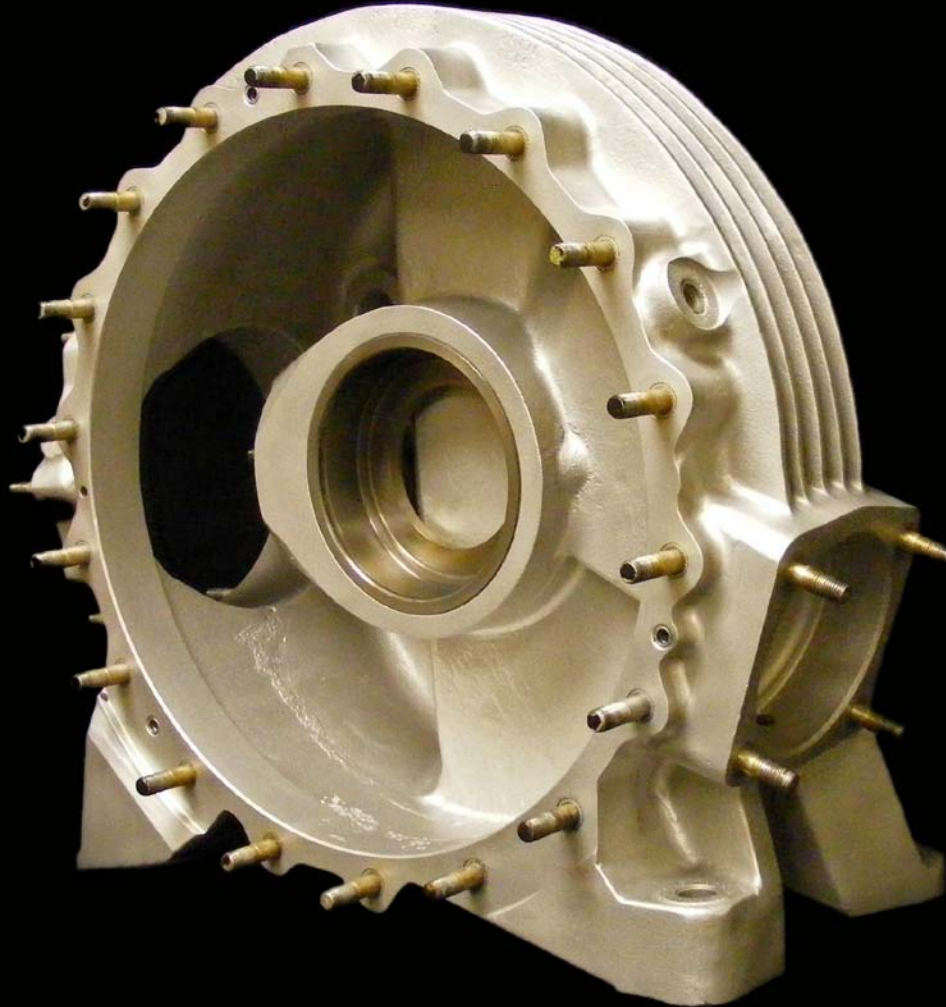


Dow 7 Chromate  
Conversion 9 Hours  
Salt Fog Exposure



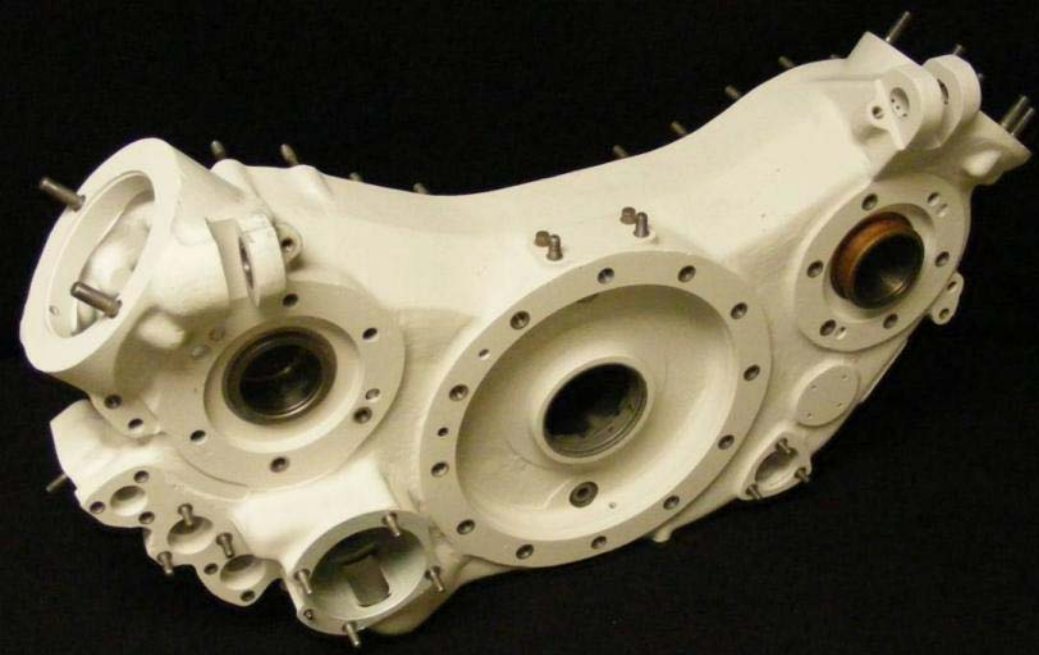
Tagnite Anodize  
168 Hours Salt Fog  
Exposure

# Why Use An Ineffective Chromate Conversion Coating During Overhaul?

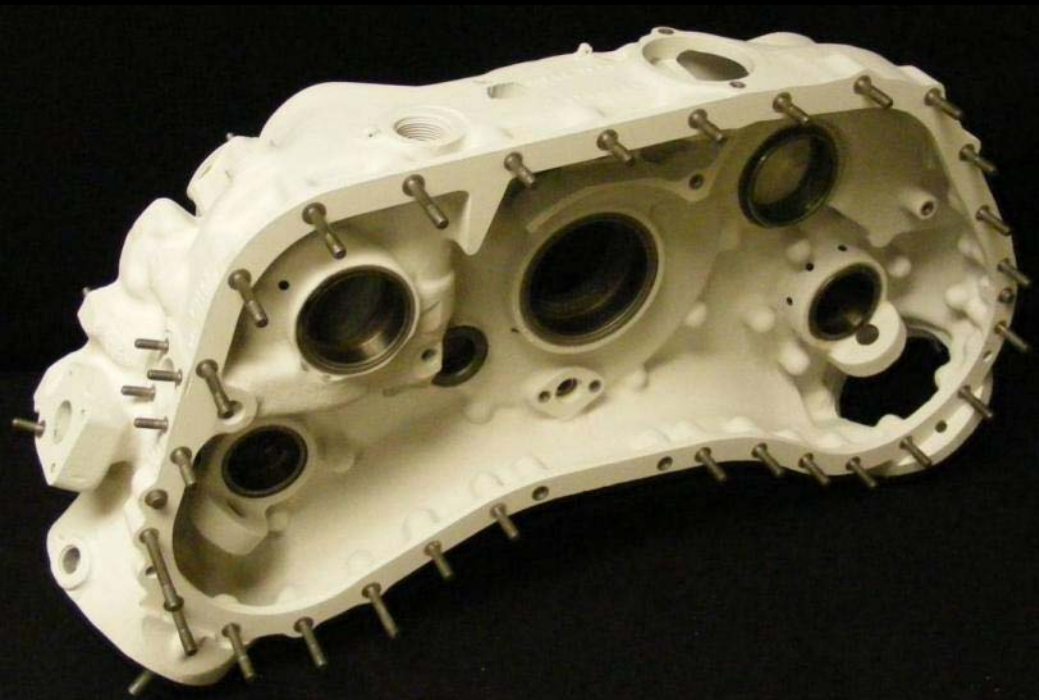


Because You Can't Anodize in Presence of Ferrous Metal Inserts. Chromate Conversion Coatings are Compatible with Ferrous Metal Inserts.





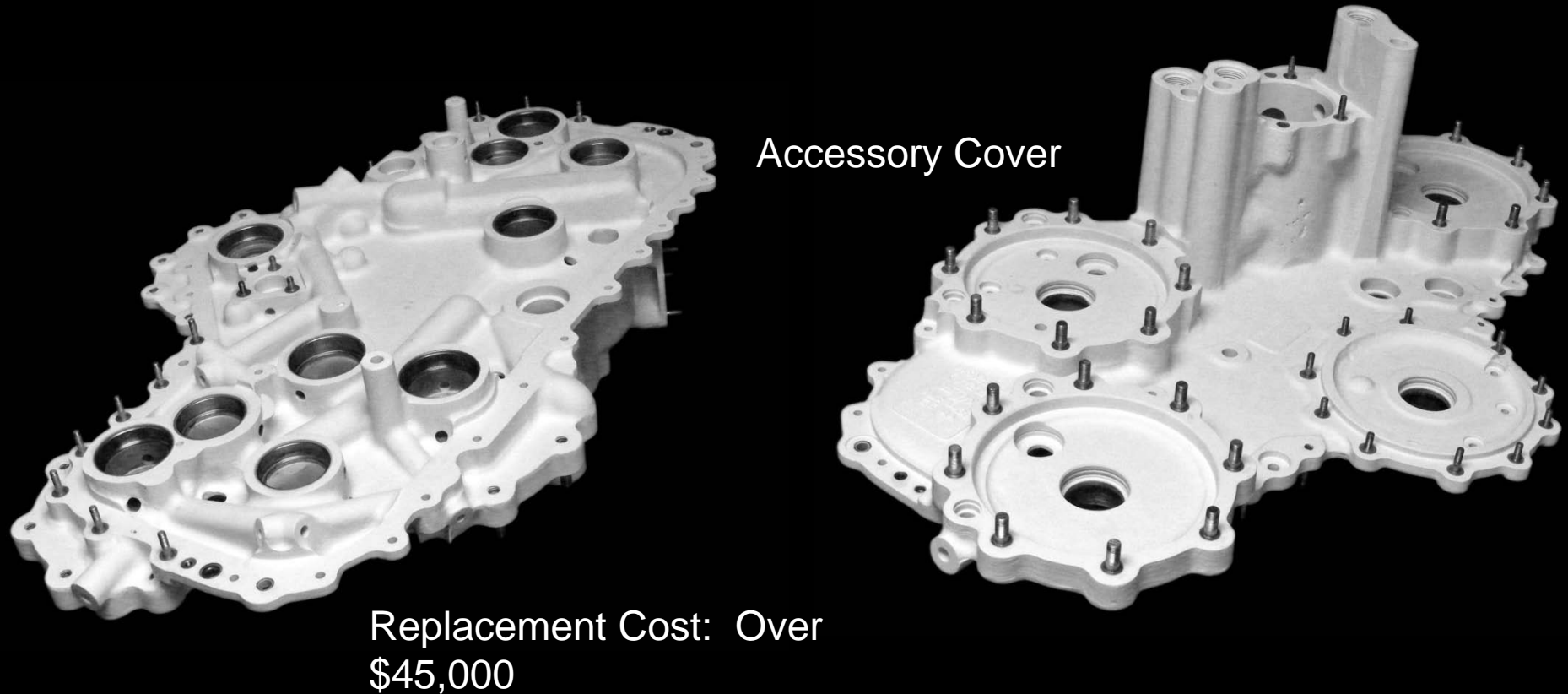
The Solution is to  
Mask The Ferrous  
Metal Inserts to Allow  
Successful  
Anodization to Occur



Successfully Anodized  
After Masking:

6 Steel Bearing Liners  
42 Helicoils  
52 Studs

# Why Spend Hours Masking Ferrous Metal Inserts to Allow Anodization When Chromate Conversion Coatings Are Inexpensive and Easy to Apply?



Because Magnesium Castings are Expensive And Require Long Lead Times to Replace



# Masking Ferrous and Anodizing Could Allow Overhaul Parts to be Better Protected Than OEM New

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Matting Faces are Often Times  
Re-Machined After Bearing Liners are  
installed. This Now Bare Magnesium is  
Then Typically Treated with a Chromate  
Conversion Coating





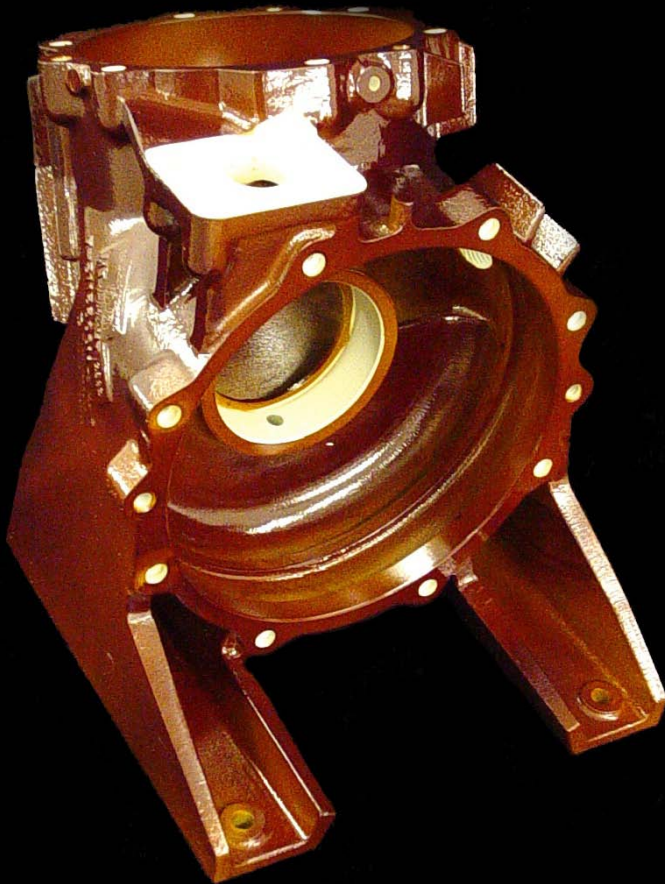
Before Bearing Liner  
Installation



Post Bearing Liner  
Installation Machining

Next Step – Apply  
Chromate Conversion  
Coating to Now Bare  
Magnesium

Before Bearing Liner  
Installation



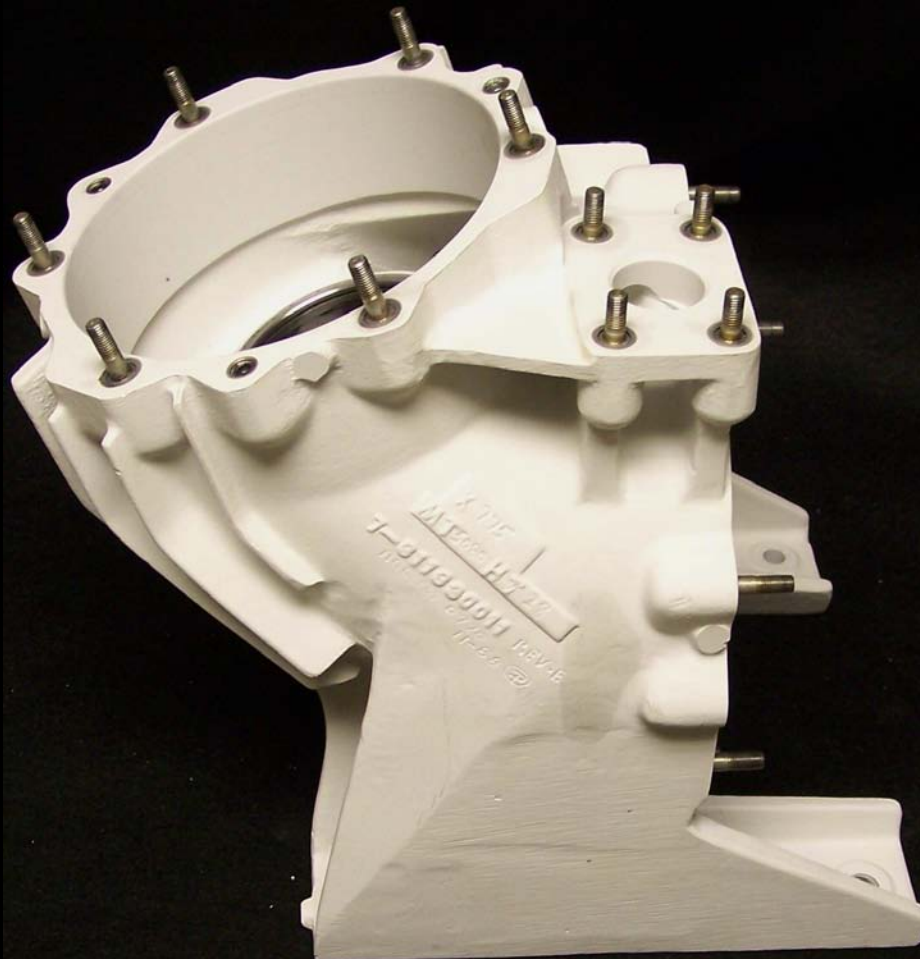
Post Bearing Liner  
Installation Machining



Next Step – Apply  
Chromate Conversion  
Coating to Now Bare  
Magnesium



## Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize



## Post Bearing Liner Installation Machining

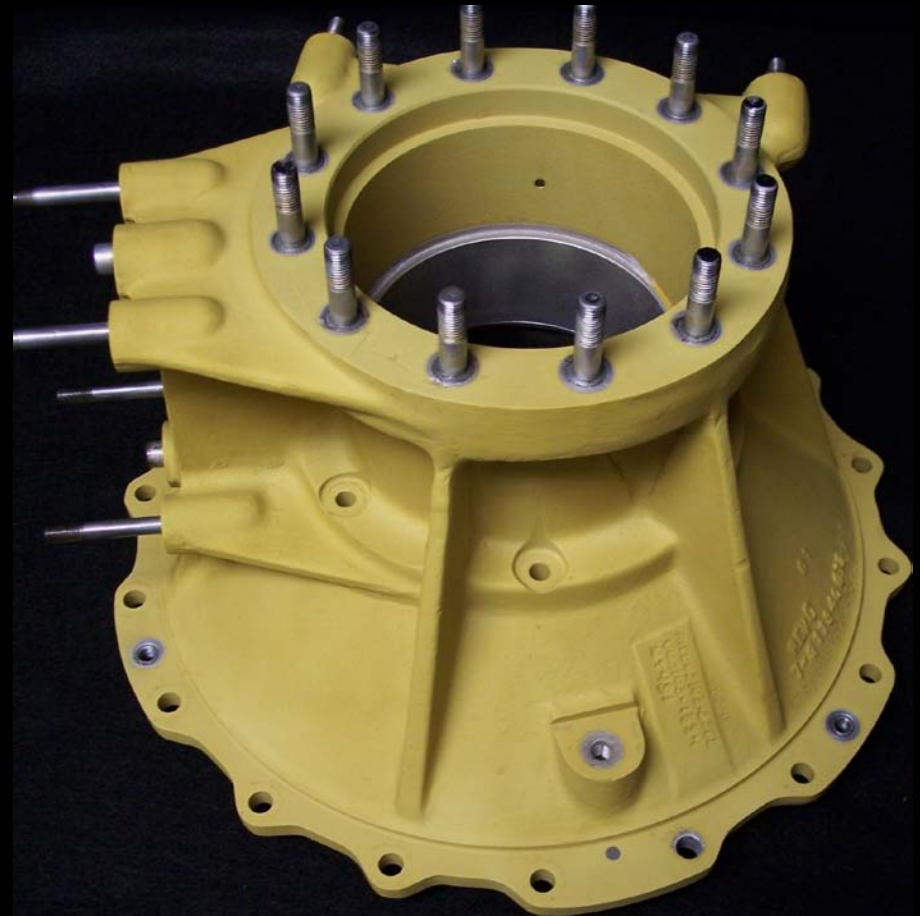
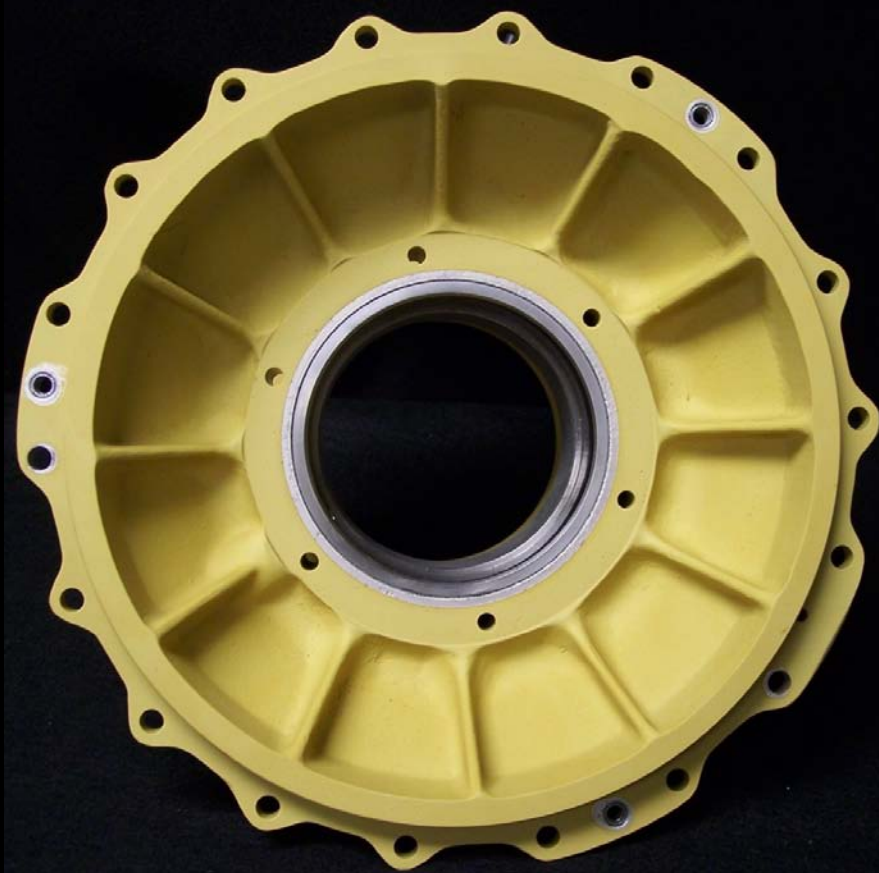
Next Step – Apply Chromate Conversion  
Coating to Now Bare Magnesium

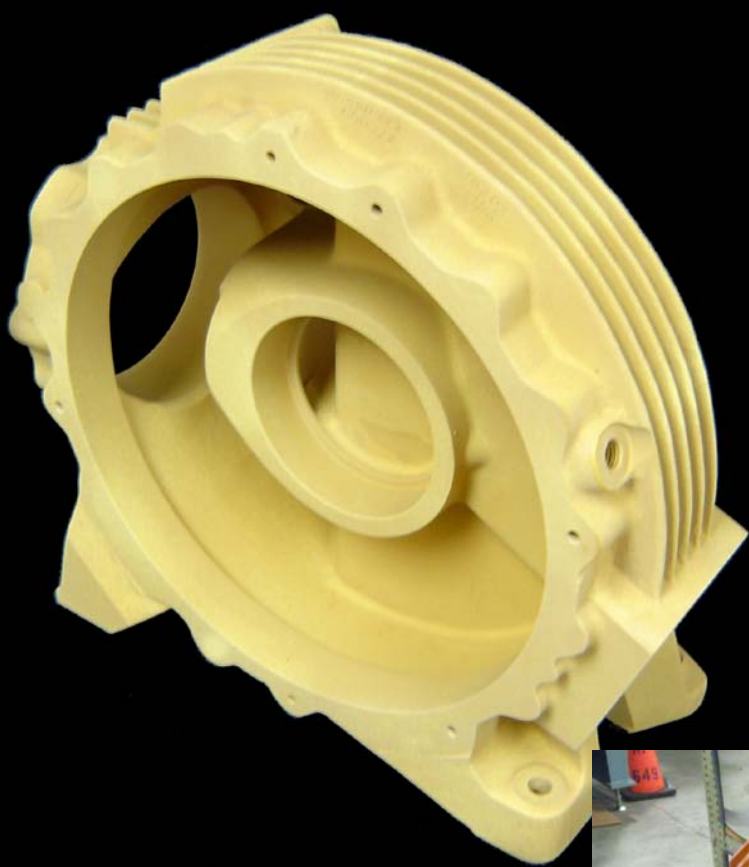
Before Bearing Liner Installation





## Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize





Post Bearing Liner Installation  
Machining

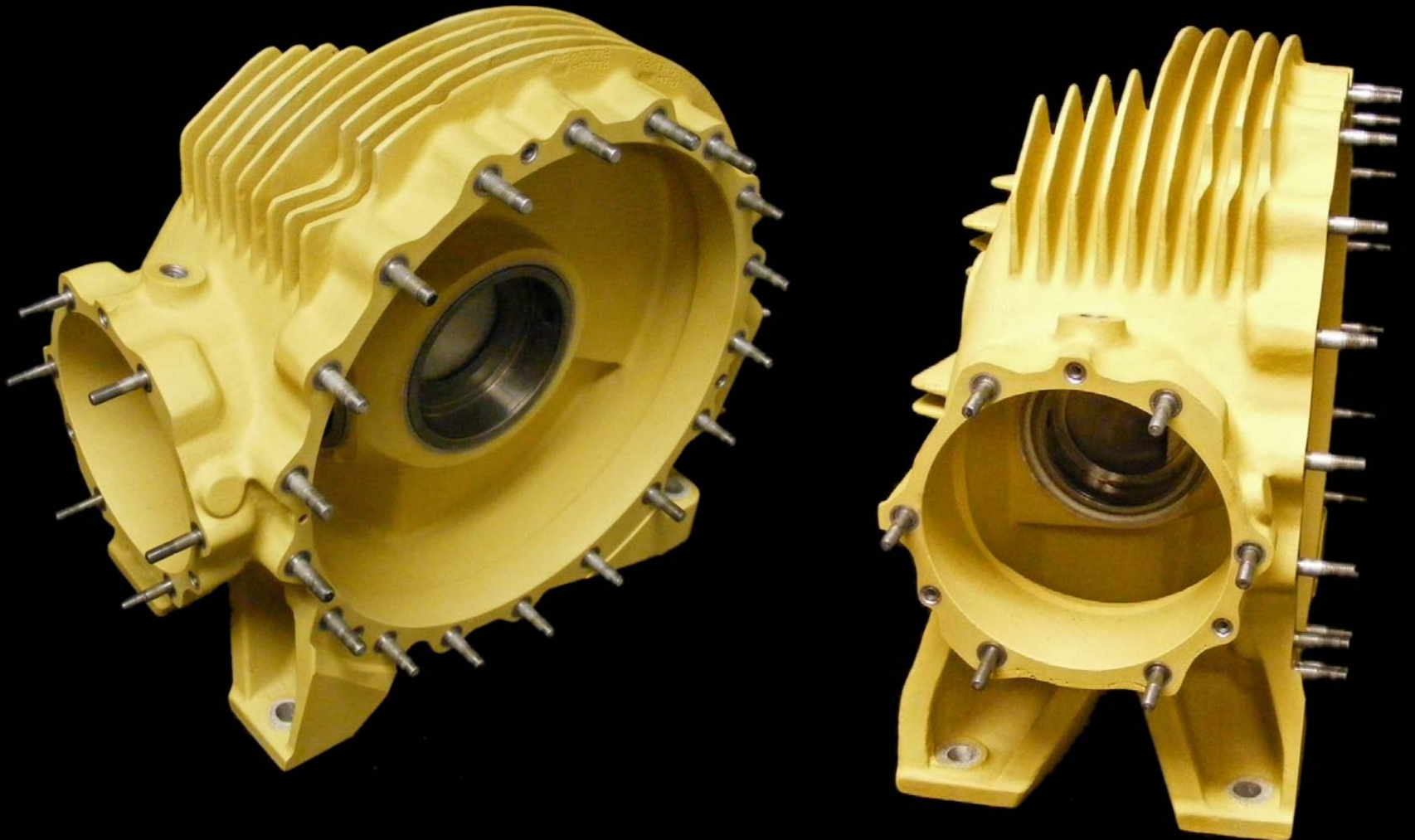
Next Step – Apply Chromate Conversion  
Coating to Now Bare Magnesium

Before Bearing Liner  
Installation





# Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize



# TAG Demo Parts – As Received

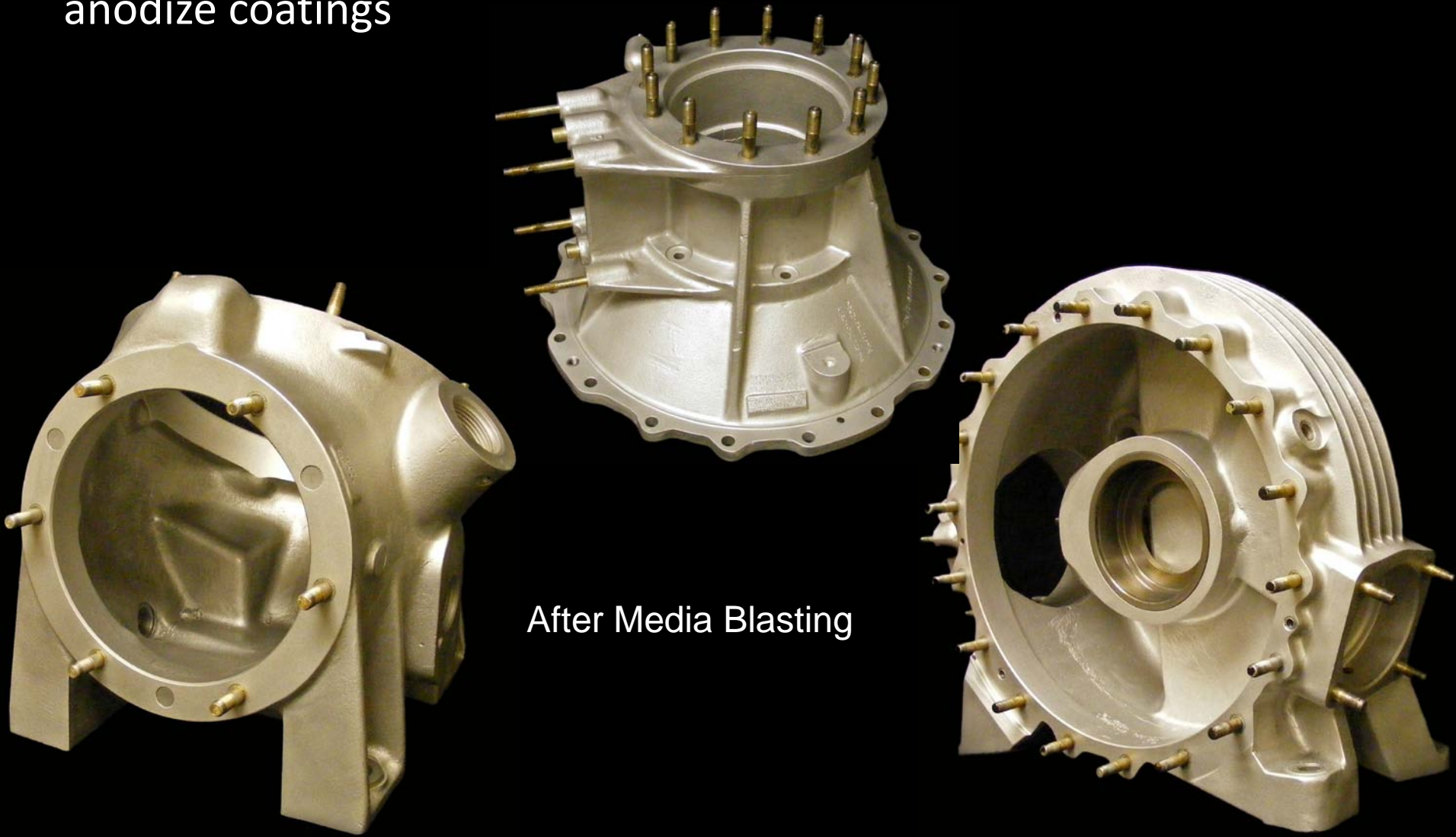
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As received condition of scrap castings as  
part of an IBIF III project



Key to Successful Anodization of Used Magnesium Castings is Starting with a Clean Casting that is free of paint and old anodize coatings



After Media Blasting



# After Media Blasting and Tagnite Anodization

## Small Data Markings Still Clearly Visible

Hand Scripted  
S/N still intact





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Approved by Many Aerospace and Defense Companies, Brush Tagnite is an Effective Method to Touch-up Magnesium Castings Without Using Hexavalent Chromium





# Why Go Through the Expense of Masking Ferrous Metal Inserts? Magnesium Castings are Expensive and Conversion Coatings are Ineffective



Bare ZE41A 9 Hours  
Salt Spray Exposure



Dow 7 ZE41A 9 Hours  
Salt Spray Exposure



Dow 19 ZE41A 9 Hours  
Salt Spray Exposure



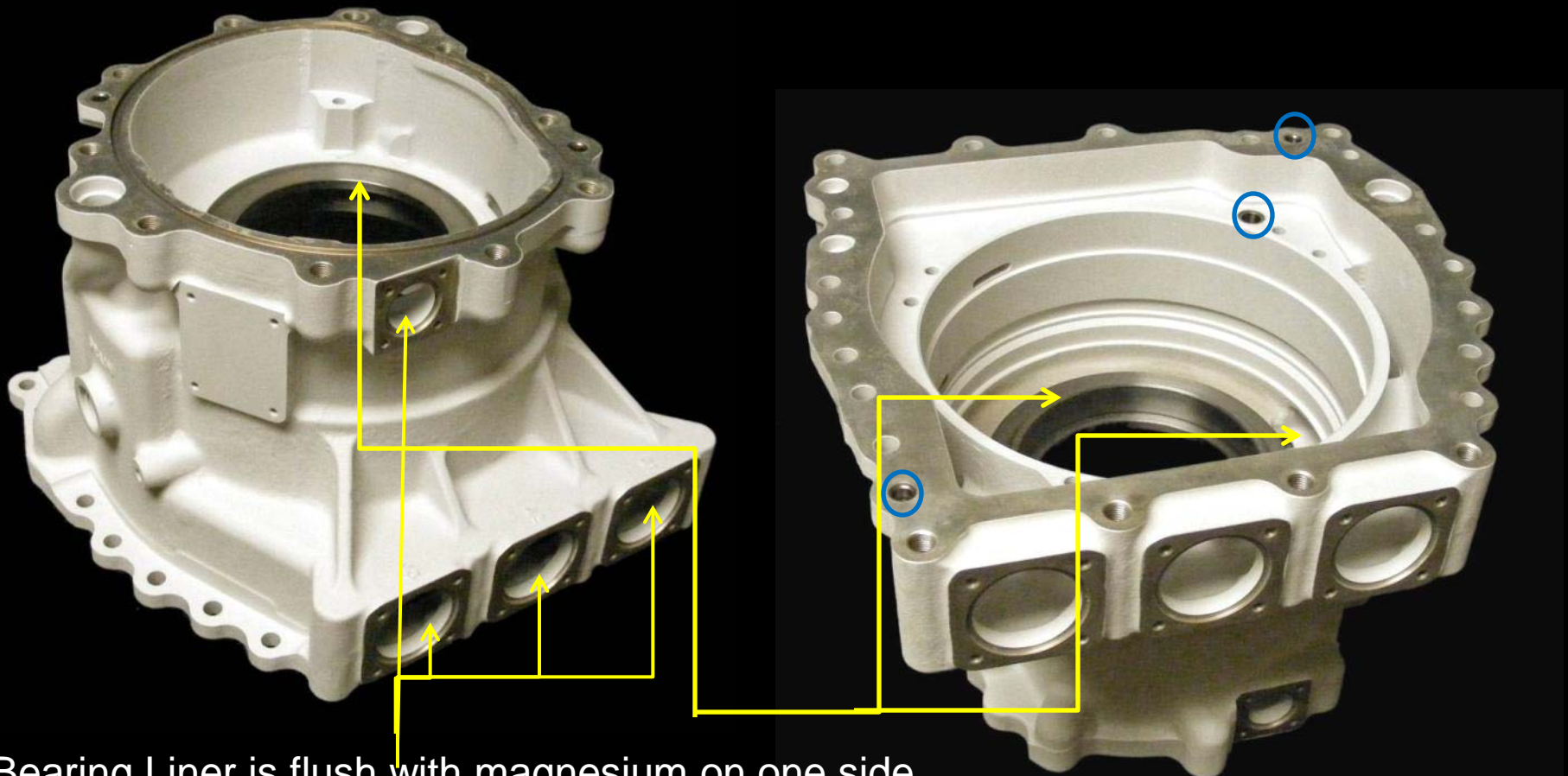
# Tagnite In Use Now on Used KC-135 and B-52 Magnesium Components

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- By selecting Tagnite the Air Force was able to eliminate hexavalent chromium and attain corrosion resistance superior to standard chromate conversion coatings typically used during overhaul
- Tagnite has been employed now on 33 different part numbers between the B-52 Bomber and KC-135 Tanker
- Well over 500 KC-135/B-52 Bomber components have been successfully coated with Tagnite.

Over 75 Units of This Production Part Number Have Been Successfully Anodized After Masking Ferrous Metal Inserts.



Bearing Liner is flush with magnesium on one side  
And raised above magnesium on other side. On raised side  
a core passage way comes directly to bearing liner.

Multiple Pressed in  
Steel Bushing

# Summary

- It is Possible to Avoid Hexavalent Chromium When Finishing New or Used Magnesium Aerospace and Defense Components
- Masking of Ferrous Metal Inserts is Expensive and Time Consuming but that Cost Represents a Small Fraction of the Replacement Cost of the Parts



A large, stylized, metallic-looking swoosh or speech bubble shape that curves around the word Tagnite.

# TAGNITE



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